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ABSTRACT

As educators become more interested in the use of qualitative methods, a major concern is the management of the large amounts of textual data during analysis. The efficiency and possibly the effectiveness of manual systems, i.e., color-coded index cards and wall-mounted systems, are reduced as the amount of textual data increases. An emerging family of text management programs, such as ASKSAM (Access Stored Knowledge via Symbolic Access Method), may help address this concern by automating aspects of the analysis and, thus, facilitating the process. A case study example that compared results achieved through the use of ASKSAM and through a file card analysis indicated that the data analyzed via the computerized approach yielded essentially the same result as had previously been obtained through the traditional analytic approach. These results suggest that the use of a computer-based text management program can increase the efficiency of the data analysis process without significantly altering the interpretations made from the data. (YLB)

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Computer-Based Text Management to Facilitate the Analysis of Qualitative Data

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TRAINING & DEVELOPMENT

RESEARCH REPORT

Graduate Program in Training & Development

The Ohio State University

U.S. DEPARTMENT OF EDUCATION
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FOREWORD

The use of computers to analyze qualitative data has become convenient only in the past few years. Only a few studies using the various packages and analytic techniques have been reported, however, and the approaches need to be better detailed for practitioners. There is at least one caution to be observed in these applications. The cognitive processes of deciding what categories of content are significant enough to look at, what key words/phrases are important enough to search for, or how to synthesize similar but not identical statements remain the province of the researcher. Although artificial intelligence may hold some promise of aiding in the judgmental aspects of analysis, current technology is primarily focused on mechanics. The glamour of computerization of mechnics should not overshadow the source of the decisions, nor should it obscure where the responsibilty for drawing the right conclusions rests.

In this paper, a description of one approach to analyzing qualitative data is described. It is of interest in this research that data analyzed via the computerized approach yielded essentially the same result as had previously been obtained through traditional analytic approaches. On one hand it is reassuring that there appears to be reliability in the computer analytic approach. On the other hand, although the study was not specifically designed to assess the effects of computerized analysis on precision or level of detail, it is at least somewhat disappointing that there did not appear to be

increased refinement of the judgments made. That the increased ease and speed with which sorts and searches can be done may improve the quality of analysis, as well as increase efficiency, is a potential effect that deserves future study.

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ABSTRACT

This paper reports the results of using a text management program to analyze a set of qualitative data. Qualitative data are generally in the form of descriptive language originating from field observations, interview transcripts, and document analyses. A continuing concern among many training and development professionals is their ability to manipulate large amounts of this text data. The efficiency and possibly the effectiveness of manual systems, i.e., color-coded index cards, wall-mounted systems, are reduced as the amount of text data increases. The results here suggest that an emerging family of text management programs, such as ASKSAM, may help address this concern by automating aspects of the analysis and, thus, facilitating the process.

The role of inquiry has been of continuing concern and growing importance for many educators in training and development (Bratton, 1983; Jacobs, 1985). This concern has been prompted, in part, by efforts to more precisely identify the education and training needs of constituent groups, evaluate the effects of on-going programs, and investigate the appropriate roles of practitioners and researchers (Hall, 1979). It is within this context that issues regarding the use of qualitative methods and the analysis of qualitative data have been raised. The specific focus of this paper is on qualitative data analysis, which is the process of categorizing and restructuring descriptive data into more understandable and meaningful themes (Bogdan & Biklen, 1982).

Qualitative data analysis is typically iterative in that the analysis occurs concurrently with data collection, and continues until all the data have been collected. Qualitative data are generally in the form of descriptive language originating from field observations, interview transcripts, and document analyses. A continuing specific

concern of many inquirers is their ability to manipulate and sort through large amounts of this textual information (Drass, 1980). A number of different text-management approaches have been proposed, including the use of color-coded index cards, wall-mounted category systems, or coded file boxes, etc. Patton (1983) and others, however, have noted that these manual systems are cumbersome, and their efficiency and effectiveness are greatly reduced as the amount of data increases.

Recent computer software advances may provide some answers to this text-management concern by automating aspects of the data analysis process. The purpose of this paper is to describe computer-based text management; relate the development of text-management programs to qualitative data analysis; present a case-study example of how one program, ASKSAM*, was used to analyze a set of qualitative data; and, discuss using a computer-based text management system. The point of this paper is that while qualitative data analysis relies primarily on the observations, interpretations, and perceptions of the inquirer, the use of a computer-based text management system can potentially facilitate the process.

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*ASKSAM (Access Stored Knowledge via Symbolic Access Method) is a commercially-available software product from Seaside Software, Corpus Cristi, Texas 78412. Our interest in this program is only within the context of improving the analysis of qualitative data. ASKSAM represents a unique class of text-management programs that may also have research utility. Other similar programs may have been used for our application.

Computer-Based Text Management

Text management is the manipulation of textual material for the purpose of working further with that material. Computer-based text management is the accomplishment of that text manipulation by partially automating the process. Word processing and data base programs may be used for computer-based text management, though these programs have limited usefulness for qualitative data analysis. To be useful in this application, a text-management program must have a flexible word-search capability, which will allow the inquirer to locate various forms of the words or phrases of interest, instead of the exact words. Word processing programs may have some word or phrase-search capability, but the sophistication of this feature is restricted by the intent of the program. Data-base programs may have a more sophisticated word-search capability than word processsing programs, but they are also limited to searching for exact word descriptors only.

There has been a progression of advancements that have enabled specialized, text-management programs to be used for qualitative data analysis. Initially, the languages and programs that possessed the desired capabilities were available only for large computers. The increased storage capacity of small computers has allowed for the subsequent development of minicomputer and microcomputer versions of the large-computer languages. For example, Drass (1980) reported the use of LISPQUAL in the analysis of a set of field notes. This program was written in the LISP language, which is now available in several versions for the microcomputer. And Ennals (1984) described the use of a microcomputer version of the PROLOG language in the analysis of

census data taken from England in 1851. While these programs have the necessary combination of structure and flexibility required for qualitative data analysis, their use as a general inquiry tool has been limited. In each of the cited studies, the inquirer developed the program from the respective language for each data analysis use. This required the inquirer to have some prerequisite programming skills in each of the languages.

The text-management program of particular interest here, ASKSAM, is part of an emerging group of programs that provide the combined capabilities required for qualitative data analysis on a small computer, while at the same time, not requiring expert understanding of a computer language. The program features a simple command-like language, built-in search functions based on Boolean logic (i.e., AND/OR logic), and a content analysis capability that will count the frequency of words or phrases. As such, these type of programs have the capability to allow greater flexibility in the identification of word descriptors. This flexibility is particularly useful during the different stages of the qualitative data analysis process. As will be shown, the program used in this case-study, ASKSAM, will not identify the emergent themes or structures within the data. That capability is limited to a few experimental programs having some degree of artificial intelligence. ASKSAM, however, does have the capability to facilitate the identification of particular text data which support the generation of themes by the inquirer. The program enables the coding of text data and displays them in their textual contexts. Each of these are important text-management activities related to qualitative data analysis.

Qualitative Data Analysis

The use of a computer-based text management program is founded on the premise that all qualitative data analysis procedures share two common phases: a mechanical phase and an interpretive phase (Drass, 1980). The mechanical and interpretive phases are progressively interwoven to form a descriptive fabric from apparently meaningless threads of information. A computer-based text management program would primarily provide for greater efficiency in the mechanical phase, though the interpretive phase would also be affected. An understanding of each phase might be helpful in order to fully understand the role of a computer-based text management program.

Mechanical phase . Much routine work is required to manage the data under analysis. This work is separate from the more judgmental or interpretive phase of qualitative data analysis, though the boundaries between the two are many times difficult to distinquish. During the mechanical phase, however, data must be stored, counted, retrieved, revised, and presented in various forms. These activities may vary in specificity, but they share a common element in that they are generally non-interpretive in nature. Skrtic (1985) provides an example of the types of activities that were documented during the mechanical phase of data analysis:

> "Detailed table of contents were developed for all relevant documents. They served as a guide to the information contained within them. Each document was assigned a number; relevant sub-parts within documents were noted by page number. This coding system was used to cross reference documentary data with card categories and to

relate both of these data sources to the outline of the case study" (p. 197).

The mechanical phase, therefore, readies the data for subsequent judgments, interpretation, and model-building by the inquirer. As Drass (1980) states, "Together with the interpretive phase, they (the activities during the mechanical phase) make the data analysis possible" (p. 334).

Interpretive phase . Qualitative data analysis is essentially interpretive work. The inquirer must use a variety of analytic techniques to begin to identify and generate significant patterns and themes from the data. Crucial to the interpretive phase is the assumed presence of an underlying structure to the data, the meaning of which can be understood only through some theoretical framework, brought to the process by the inquirer. The meaning of the data is established and confirmed through further checking and cross-checking of additional data and data sources.

Thus, the mechanical and interpretive phases are highly related and mutually supportive. The accomplishment of the interpretive aspects of data analysis cannot occur without reliance on the mechanical manipulation of the data. As Drass (1980) states, ". . . interpretive work requires data manipulation of the mechanical operations yet, at the same time, the interpretive work will dictate the type and, in many cases, the content of mechanical operations" (p. 337). The following statements may provide greater understanding of how the two phases are interwoven during the inquiry:

*Knowledge of a phenomenon is generated in situ (interpretive), but physically broken down into

thematic parts for analysis (mechanical).

*Knowledge of a phenomenon is built through components of meaning (interpretive) as data are categorized (mechanical).

*The knowledge base must be readily accessible (mechanical) so as to aid the triangulation and auditing of knowledge; thus, confirming the understanding of meaning (interpretive).

Computer-Based Text Management Case-Study

The subject of the case-study is a set of critical incidents that were reported as part of a study to analyze the interpersonal skill requirements of supervisors (Jacobs, 1986). These data were used for two reasons. First, the analysis of critical incidents is, in many respects, representative of the analysis approaches used with most other forms of qualitative data. That is, whatever factors that may exist in the critical incidents to explain their underlying meanings is determined through an intensive process of searching for recurring themes and ideas, confirming these themes through the analysis of additional critical incidents and data sources, and eventually naming the themes.

Second, the use of qualitative data that had originally been analyzed by one of the present authors provided a unique opportunity for comparing the manual and computer-based approaches to data analysis. It was hoped that the author's insights about the original setting might provide additional understanding about the differences between the two approaches. As such, additional information (i.e., Personal Notes, Methodological Notes, and Theoretical Notes) were also

analyzed with the critical incidents, which were represented as Field Notes (See Table 1). These categories of organizing qualitative data, as suggested by Corsaro (1981), provided the opportunity for all aspects of the inquiry setting to be included in the analysis.

The following is a summary of how ASKSAM was used to analyze the data in the case-study example:

1. All text data (Field Notes, Personal Notes, Methodological Notes, and Theoretical Notes) were entered in free form, similar in the way the data might be organized by the inquirer for a personal record. Each Note was entered as a separate data record. Headings and other clerical data (i.e., Scene, Activity, Participants) were entered as structured fields.

2. Broad themes and ideas were identified through an initial analysis of the text data. For example, after reading the Theoretical Note and Field Notes, the authors hypothesized that supervisors seemed to use their offices as a setting to convey information to subordinates. Thus, the concepts of supervise and office were believed to have some significance that might justify further analysis. In that sense, ASKSAM was used here to confirm the impressions documented in the Theoretical Note by identifying the location and frequency of the words within their various textual contexts.

3. A command sequence was written to locate forms of the words supervisor and office as they appeared together in each data record. In a procedural sense, the sequence accomplished this task by first sorting all the data records using a code to distinguish the data records of interest from other records that might have been

stored on the same disk. Then the sequence reviewed the remaining sets of records, searching for the words of interest within each record. Table 2 presents the specific command sequence used in this case study. Of importance, the inquirers were able to locate other forms of the word supervisor by placing an asterisk (*) after the prefix, supervis . As a result, other forms of the word, such as e.g., supervise , supervisory , supervising , would also be located if they as well appeared in the same data record with office .

4. The results of the query were extracted and presented in bold letters within their respective data record (See Table 3). The results showed that the pairing of the words supervisor and office occured wihin two Field Notes and the Theoretical Note. One additional variation of supervisor was also located, supervisor's . The results as presented could also have been reviewed on the display screen or stored within a special file on the data disk for later retrieval. The results of this analysis confirmed the relatively high frequency of supervisor's references to their office (two of four Field Notes), and presented all the textual contexts in which the references occurred.

Further interpretations of the data could have been accomplished at this point by the inquirers through the generation of new themes and categories. That process, however, was beyond the scope of this research. A theme-name code could have been inserted at these data points to allow for the subsequent sorting and assembling of all the text-data under that theme name, such as e.g., "Using the office as a setting for supervisor-subordinate communications." These codes could also facilitate the displaying of the inferential trail, which

would be helpful when conducting an external audit of the inquiry (Halpern, 1983). Additional questions that might have guided subsequent data analyses and collection activities include: Under what specific conditions do supervisors use their offices? What symbolic meaning does the office represent to supervisors? Does use of the office mediate the effectiveness of the communication between supervisor and subordinates?

5. Of note, the command sequence could have been written to allow the results from this query to be related to the results of subsequent or previous queries. In this way, many different text relationships can be investigated.

Discussion

The results of this case-study example were, in most respects, similar to those found when the data were originally analyzed using 3 x 5 file cards. In the original analysis, the supervisor-office relationship was also noted, and was subsequently integrated with information generated from other critical incidents. These data were collapsed into a more general supervisory characteristic, which was labeled, supervisor as counselor (Jacobs, 1986). One can only presume that if all 120 critical incidents had been included in the computer-based analysis, the results would also have been similar.

Of note, however, was the relative ease by which the command sequence was written and the efficiency by which the text-data were analyzed. The simple command-sequence generated for this case study would not differ in form even if more text-data had been entered. In addition, the original study required the analysis of approximately 120 critical incidents, which at that time required several half-day

sessions to sort and categorize. In the present example, the co-author of this paper analyzed all data records using the computer-based approach in several minutes. It is not possible to compare fully these two approaches because of the differences in the amount of text-data analyzed. Our experience, however, suggests that the use of a computer-based text management program can increase the efficiency of some aspects of qualitative data analysis to a significant degree.

The results of the case-study example suggest that the use of a computer-based text management program can increase the efficiency of the data analysis process without significantly altering the interpretations made from the data. The results presented here are similar to those reported by Drass (1980), who re-analyzed a set of field notes that were originally presented in Boys in White by Becker et al. (1961). The use of a text-management program, however, raises additional concerns that should be considered for future research on this topic. These concerns, and suggestions about them, are the following:

*Computers present information in a linear fashion only. Some important insights may not be apparent when analyzing data using a computer as they might when using a manual system. Manual systems may allow a more wholistic review of the text-data. Computer-based approaches may be limited in this way. We suggest that computer-based and manual data analysis approaches be integrated so that the advantages of each may be utilized.

*Over-reliance on a computer-based approach to

perform more of the data analysis functions than was intended. ASKSAM, and other similar programs, are to be used only to facilitate the mechanical aspects of the process. Use of the program is not intended to replace, in any fashion, the interpretive aspects of the process. We suggest that inquirers explicate in advance the role of the computer-based and manual data analysis approaches. This documentation is consistent with recent advances in ascertaining the rigor of qualitative research through an external auditing process.

*Additional research and experimentation using computer-based text management programs is essential. Confidence in the reliability of these approaches has not been fully established. The use of naive investigators using both methods to determine whether the categories that emerge would be parallel is desirable for future research. We suggest that until specific guidelines are generated from future research efforts, any computer-based approach to qualitative data analysis should be used only for comparison and confirmation purposes.

Conclusion

There is a growing interest in the use of qualitative methods among educators. One major concern about the use of qualitative methods is the management of the large amounts of text-data during analysis. Qualitative data analysis is essentially interpretive work, though much mechanical manipulation is also required. The mechanical phase readies the data for subsequent judgments and interpretations

derived from the data. Until recently, the mechanical phase of qualitative data analysis was accomplished mostly through various manual systems. Interest in the use of a computer-based text management program represents a logical extension in attempts to increase the efficiency of the qualitative data analysis process. These attempts may as well lead to a more thorough and imaginative exploration of qualitative data.

Table 1
Qualitative Data Analyzed using ASKSAM*

Field Notes:	An employee has been taking an inordinate amount of sick-leave days. The supervisor questioned her and explained that when she is not at work, other employees have to pick up the slack caused her absence. The supervisor asserted the importance of maintaining good service to the customer. The supervisor also advised the employee about the regulations requiring a physician's letter documenting the extent of the illness.
	A customer calls the postmaster and complains that the carrier omitted her house. The supervisor responded by calling the carrier into his office for a meeting. The supervisor listened to the carrier's explanation. The supervisor reasserted postal service policy regarding the intentional omission of a delivery box and suggested the carrier inform him of any problems in the future.
	An employee is assigned to unload a mail truck alone. The supervisor assessed the situation, and asked whether the employee required help because of the amount of bags in the truck and an impending deadline. The employee responded that he could handle the job, and acknowledged the concern of the supervisor.
	An employee's productivity has decreased noticeably in the past few weeks. The supervisor discussed the situation with the employee to find out the nature of the problem. The supervisor listened to the employee's discussion of a personal problem and then suggested some alternatives so that her work performance might be less affected.
Personal Note:	Respondents have difficulty understanding my request for information. I have had to provide an example for almost every person. Generating critical incidents seems to be a difficult task.
Methodological Note:	I realize that I am collecting only effective critical incidents. All of the stories seem to have a successful resolution. I must attempt to probe the respondents more deeply.
Theoretical Note:	Many of the supervisors have reported using their offices to convey information to subordinates. This could be an important area to explore because it may affect supervisor-employee relationships.

*From Jacobs (1986)

Table 2
ASKSAM Command Sequence

```
:extract  (caps)  (PRINT)
(sort Page[)
RDA200-* RDA200-* (AND) supervis* supervis* (AND) office
(IMAGE ALL LINE =)
(ROW 1 COL 36 "FIELD NOTES)
(ROW 2 JUSTIFY 15 "Scene:" COL 17) Scene[
(ROW +1 JUSTIFY 15 "Activity:" COL 17) Activity [
(ROW +1 JUSTIFY 15 "Participants:" COL 17) Participants[
(ROW +1 JUSTIFY 15 "Date:" COL 17) Date[ (COL 34 "Page:") Page[
(ROW +1 NOT LEADING 5)
```

Table 3

Results of ASKSAM Analysis

Scene: A U.S. Postal Service facility
Activity: Human Relations Critical Incidents
Participants: **Supervisors**

FN: An employee's productivity has decreased noticeably in the past few weeks. The **supervisor** discussed the situation with the employee in the **supervisor's office** to find out the nature of the problem. The **supervisor** listened to the employee's discussion of a personal problem and then suggested some alternatives so that her work performance might be less affected.

FN: A customer calls the postmaster and complains that the carrier has omitted her house. The **supervisor** responded by calling the carrier into his **office** for a meeting. The **supervisor** listened to the carrier's explanation. The **supervisor** reasserted postal service policy regarding the intentional omission of a delivery nbox and suggested the carrier should inform him of any problems in the future.

TN: Many of the **supervisors** have reported using their **offices** to convey information to subordinates. This could be an important area to explore because it may affect supervisor-employee relationships.

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